

Before the
Federal Communications Commission
Washington DC 20554

In the Matter of)
)
Revision of Part 15 of the Commission's Rules) ET Docket 98-153
Regarding Ultra-Wideband Transmission)
Systems)

COMMENTS OF THE GROUND PENETRATING RADAR INDUSTRY COALITION

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The Ground Penetrating Radar Industry Coalition (GPRIC) files these Comments on the Commission's report: *Measured Emissions Data for Use in Evaluating the Ultra-wideband (UWB) Emissions Limits in the Frequency Bands Used by the Global Positioning System (GPS)*, Project TRB 02-02 (October 22, 2002) (GPS Noise Report).¹

A. SUMMARY

Both theoretical considerations and practical experience show that ground penetrating radar (GPR) will not interfere with GPS at the Part 15 general limits, even in the quiet outdoor RF environment found in the GPS Noise Report.

B. BACKGROUND

The GPRIC filed a timely Petition for Partial Reconsideration of the First Report and Order in this proceeding.² We showed that certain of the rules applicable to ground penetrating radars (GPRs) were adopted unlawfully, in contravention of the Administrative Procedure Act

¹ The GPRIC consists of Geophysical Survey Systems, Inc., Mala Geoscience, Inc., Sensors & Software, Inc., and Underground Imaging Technologies. These companies account for over 98 percent of the ground penetrating radar units sold in the United States.

² Petition for Partial Reconsideration of the Ground Penetrating Radar Industry Coalition (filed June 17, 2002), seeking reconsideration of *Ultra-Wideband Transmission Systems*, 7 FCC Rcd 7435 (2002) (First Report and Order).

(APA). Among these was Section 15.509(d), setting emissions limits for GPRs well below the Part 15 general limits. Equally harmful to the industry is Section 15.509(a), requiring all of a GPR's "UWB bandwidth" to lie below 960 MHz. Both rules were adopted without any support in the record.³

GPRIC experience and uncontroverted evidence in the record indicates that GPRs will not cause interference if allowed to operate at the Part 15 general limit of -41.3 dBm, which is 24 dB higher than the present rules.⁴

The GPS Noise Report found that outdoor emissions levels in the GPS L1 and L2 bands are generally a few dB lower than the present GPR limits, or about 25-30 dB below the general limits.⁵ Still, although GPRs are used outdoors, the ambient noise levels are not a proper basis for evaluating emissions limits. The appropriate criterion is the sensitivity of GPS devices to GPR emissions.

This comment explains why the GPRIC request to raise the GPS-band limits is technically sound and will not cause interference to GPS, notwithstanding the relatively quiet outdoor environment.

³ See GPRIC Petition at 16-19. The other challenged rules: Section 15.509(b)(1) (limiting GPR operation to law enforcement, fire and emergency rescue organizations, scientific research institutes, commercial mining companies, and construction companies) was adopted without notice and comment, in violation of Section 553(b)(3) of the APA, and without any support in the record. And Section 15.525 (requiring prior coordination of GPR operation with NTIA) was likewise adopted without notice and comment, and without any support in the record.

⁴ GPRIC Petition at 5-8. GPRs at 960-1619 MHz (which includes the GPS bands) are now subject to a limit of -65.3 dBm/MHz. First Report and Order at para. 50.

⁵ GPS Noise Report at 23-24. Measurements were taken at air, sea, rail, and industrial facilities.

C. ALL EVIDENCE IN THE RECORD AGREES THAT GPRS OPERATING AT THE PART 15 GENERAL LIMITS WILL NOT INTERFERE WITH GPS.

1. NTIA established that low-PRF UWB (including GPRS) does not interfere with GPS.

NTIA evaluated GPS interference caused by UWB devices with differing pulse repetition factors (PRFs). The results plainly show that low PRF devices -- typical of GPRS -- *cause no interference to GPS at the Part 15 general limits.*⁶ Taken together, the data show some increase in GPS interference with increasing PRF. Although interference at the general limits may become significant at sufficiently high PRFs, in excess of 1 MHz, the NTIA data show it is non-existent at the PRFs characteristic of GPRS.

According to the GPS Noise Report, the Commission's GPS-band emissions limits derive from an NTIA-provided receiver susceptibility threshold of -117.5 dBm/MHz.⁷ But a glance of the NTIA data shows the -117.5 dBm/MHz figure applies only the worst-case PRF studied, at 20 MHz.⁸ At low PRFs, the GPS receiver functioned properly at UWB levels tens of dB higher.⁹ Even if the Commission's emissions limits are appropriate for other types of UWB devices with a 20 MHz PRF, they are far too conservative for GPRS.

⁶ *Assessment of Compatibility Between Ultrawideband (UWB) Systems and Global Positioning System (GPS) Receivers* (Report Addendum) NTIA Special Publication 01-47 at xi (November 2001). *See also Measurements to Determine Potential Interference to GPS Receivers from Ultrawideband Transmission Systems*, NTIA Report No. 01-389, Addendum to NTIA Report 01-384 at pages 9-11, Figures 3.1, 3.3, and 3.5 (September 2001).

⁷ GPS Noise Report at 9.

⁸ *See Measurements to Determine Potential Interference to GPS Receivers from Ultrawideband Transmission Systems*, NTIA Report No. 01-389, Addendum to NTIA Report 01-384 at pages 9-10, Figures 3.1, 3.3 (September 2001).

⁹ *Id.*

Taking PRF into account, there is simply no support in the record for GPR emissions limits below the general limits.

2. *Parties to the proceeding agree that GPRs do not cause interference.*

Parties on both sides of the UWB controversy agree that GPRs are not a source of interference. Some of UWB's most implacable opponents, including the GPS-oriented Air Transport Association, expressly conceded they are not concerned about interference from GPRs.¹⁰ Other anti-UWB parties agree, including PCS interests, the amateur radio community, and the DARS industry.¹¹ NTIA's own study of UWB interference into GPS concluded that GPRs are deployed too thinly to cause interference.¹²

¹⁰ Air Transport Association said:

Precautions such as limiting UWB operations in the restricted bands to . . . UWB devices such as Ground Penetration Radar Systems ("GPRS") that direct most of their energy to the ground ultimately may serve to minimize the impact of any harmful interference by UWB operations on GPS and other safety-of-life operations.

Comments of Aeronautical Radio, Inc. and the Air Transport Association of America, Inc. at (filed Sept. 12, 2000).

¹¹ See Sprint PCS Supplemental Comments at 2 n. 3 (filed Oct. 6, 2000) ("so long as these [penetrating radar] are niche applications that are not mass marketed, Sprint does not necessarily oppose these applications"); Comments of ARRL, the National Association for Amateur Radio at 16 (filed Sept. 12, 2000) ("ARRL does not object to permitting GPRs to be operated anywhere in the spectrum . . . subject to appropriate emission limits. Those devices are obviously going to be deployed in limited numbers for limited times, and the majority of the RF energy is aimed into the ground")' Reply Comments of XM Radio Inc. at 6 n. 8 (filed Oct. 27, 2000) (GPRs "are unlikely to pose a significant threat of interference to DARS reception.")

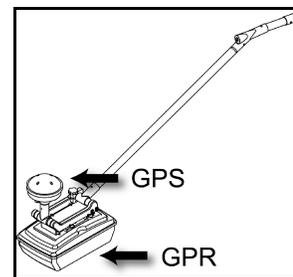
¹² *Assessment of Compatibility Between Ultrawideband (UWB) Systems and Global Positioning System (GPS) Receivers*, NTIA Special Publication 01-45 at xiv, 4-4, 4-21 (February 2001).

3. *GPRs are necessarily used in the immediate vicinity of other devices that constitute a greater hazard to GPS.*

A GPR in the field is never used in isolation. The operator also needs a laptop to record data, a cell phone to communicate with coworkers and office, and probably a PDA as well. The laptop and PDA are permitted to emit at Class B limits, as are the digital electronics in the GPR itself.¹³ And the cell (or PCS) phone is permitted out-of-band emissions that are fully 28 dB higher than Class B.¹⁴ Compared with these other devices, the interference threat from GPR emissions is insignificant.

4. *GPS receivers work perfectly just centimeters away from a GPR antenna.*

Many GPR systems routinely operate with a GPS receiver fixed directly to the unit. (See Figure 1.) Nearly all GPR systems have both hardware and software specifically designed to accommodate the GPS function, which is needed to map locations of GPR readings. The GPS invariably functions perfectly, just centimeters from the GPR transmit antenna. Operators' long experience shows that GPRs have no effect on GPS operation. Indeed, we do not know of a single instance in which interference occurred.



**GPR with Mounted GPS
Figure 1**

CONCLUSION

The Commission should grant the reconsideration requested by GPRIC by increasing the GPR emissions limits to the Part 15 general limits, and should eliminate the rule keeping "UWB

¹³ 47 C.F.R. Secs. 15.109(a), 15.521(c).

¹⁴ See 47 C.F.R. Secs. 22.917, 24.238 (maximum out-of-band emission of -43 dBW). This compares to -71.5 dBW for Class B.

bandwidth" below 960 MHz. Doing so will not cause interference to GPS, or any other service, notwithstanding relatively quiet outdoor environments.

Respectfully submitted,

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